SIMPLE ALGEBRAIC COARSE GRID BASED PRECONDITIONER FOR ADAPTIVE hp SCHEMES

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We will report here on the development of a simple algebraic coarse grid for solving large systems arising from adaptive hp approximations of classical linear elastostatics. hp adaptivity especially in three space dimensions leads to very irregularly sparse and poorly conditioned systems. The use of distributed memory parallel computing (on e.g. the ubiquitous clusters of Linux based personal computers) implies that a Krylov space scheme is used to solve these systems. These systems have to be appropriately preconditioned to enable this solution methodology. Key to a successful preconditioner is a "coarse grid" solve. We will present here a simple construction of such a coarse grid using only algebraic information. As expected the solver is quite robust with regard to both h and p re nements. We have also observed that the solver performs extremely well in the presence of material discontinuities. We will also briefly outline implementation of the solution scheme with parallel data structures and partitioners.

References

[1] A. C. Bauer, S. Sanjanwala and A. Patra, "Portable Efficient Solvers for Adaptive Finite Element Simulations of Elastostatics in Two and Three Dimensions", in Recent Developments in Domain Decomposition Methods L. F. Pavarino and A. Toselli ed., Springer, 2002.